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Research Article

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Analysis of User Satisfaction Index and Improvement Ratio of Technology Prototype based on Pixy CMUcam5

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Abstract The first stage of the Vision Sensor-based working time measurement technology has been developed and its usability testing has been carried out on a laboratory scale. The technology consists of hardware components involving the Pixy CMUcam5 and software programming used Visual Studio 2015. Monitoring the advantages and disadvantages of technology, research is conducted on user satisfaction with the technology designed, where the purpose of this study is to determine the level of user satisfaction and the ratio of improvements that must be prioritized. Data analysis will use the user satisfaction index (IKP) analysis. Research respondents were technology users at the time of laboratory-scale usability test with a team of research assistants, meaning 12 people. The data were collected using a questionnaire consisting of 18 question attributes at the level of expectations and perceptions. The results show that the indicators that have a negative IKP value are (1) the completeness of application program features (-0,500), (2) technology is easy to operate (-0,417), (3) connected technology components (-0,417), (4) technology easy to assemble (-0.333), (5) technology is easy to remove (-0.333). This shows that consumer expectations on the five indicators are very high and have not been fulfilled, so indicators are needed. Based on the ratio of improvements, indicators that must first are (1) the completeness of application program features (1,154), (2) technology is easy to operate (1,111), (3) connected technology components (1,111), (4) technology easy to assemble (1,111), (5) technology is easy to remove (0.873).

Keywords Technology based on Pixy CMUcam5, user satisfaction index, improvement ratio

Introduction

In measuring working time, the direct time study method is used, manually with a stopwatch. Measuring working time with this method has several constraints, one of which is the time required to carry out the process of measuring working time to processing work time and presenting it in the form of a working standard time that is too long [1].

To simplify and speed up the process of measuring working time, the first stage of the Vision Sensor-based Working Time Measurement Technology has been developed and usability testing has been carried out on a laboratory scale [2-4]. This technology consists of hardware components that involve the Pixy CMUcam5 which is integrated with the Arduino Uno Rev 3 with AT Mega 328P and the Logitech C930E series webcam. As well as the programming language used to support hardware movement, namely the Visual Studio 2015 programming language.

After developing and testing the capabilities of the Pixy CMUcam5 based technology, the next step is to find out the advantages and disadvantages of this technology. For this reason, research is needed on user satisfaction with the designed technology, so that improvements can be made or developed of the technology.

Consumer satisfaction is the assessment of each consumer by comparing the existing conditions with the expected conditions. If the products provided by the company match the expectations of users/consumers, consumers will be satisfied. Conversely, if the products provided by the company following with consumer expectations, consumers will feel disappointed [5-6].

Determining user/consumer satisfaction with service products is measured using the dimensions of product quality, namely performance, durability, conformance to specifications, features, reliability, aesthetics, service capabilities, and perceived quality [5-6].

In previous research, Khotimah and Purwanti [6] used a customer satisfaction index (IKP) analysis to determine the level of consumer satisfaction with products in Mr. Teto. Where the results show that the average level of conformity of the indicators of product quality is <100%, it can be said that consumers are not satisfied with the quality of Mr. To's products. The highest conformity level value is the service capability indicator of 95.14%. While the lowest is the feature indicator of 90.06.

Yuliani et al. [2,4] and Yuliani [1] use the ratio of improvements in determining the variables that must be fixed in the products they design so that the improvements made are adjusted based on priority to be more focused, effective, and efficient. So the purpose of this study is to determine the user satisfaction index of working time measurement technology and determine the ratio of improvements that must be prioritized.

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Yuliani et al. [2,4] and Yuliani [1] use the ratio of improvements in determining the variables that must be fixed in the products they design, so that the improvements made are adjusted based on priority to be more focused, effective and efficient. So the purpose of this study is to determine the user satisfaction index of working time measurement technology and determine the ratio of improvements that must be prioritized.

Data Collection Methods

The research steps are as follows:

a. Determine research respondents

The number of research respondents was 12 students, 4 as research assistants and 8 students as respondents of the usability test who had experience using technology.

b. Determine the questionnaire variables

Determine the definition of operational variable characteristics of consumer / user needs for the development of PIXYCMUcam5-based working time measurement technology products in the preparation of attributes to be used based on product development dimensions. The operational definitions of the variables are shown in Table 1.

c. Distribution of Questionnaires

Where data collection techniques through questionnaires and FGD to be more focused on determining the characteristics of user needs.

d. Testing the Validity and Reliability of the Questionnaire

Test the validity and reliability of the questionnaire by using the correlation coefficient test and Cronbach's Alpha.

e. Planning Matrix

1. **Level of User Satisfaction (Customer Satisfaction Performance)**

   Determine the level of user satisfaction with the formula:

$$\text{Customer Satisfaction Performance x} = \frac{\sum \text{Variable}}{\sum \text{Respondent}}$$

2. **User Expected Performance (Customer Expected Performance)**
   Determine the level of user expectations with the formula:

$$\text{Customer Expected Performance x} = \frac{\sum \text{Variable}}{\sum \text{Respondent}}$$

3. **User Satisfaction Index (IKP) Analysis**
   The User Satisfaction Index (IKP) can be calculated using the formula:
   IKP = **Customer Satisfaction Performance - Customer Expected Performance**
4. **Determine Goals**
   Determines Goal value for each attribute.
5. **Determine the Improvement Ratio**
   Determine the value of the improvement ratio with the formula:

$$\text{Improvement Ratio} = \frac{\text{Goal}}{\text{Customer Satisfacation Performance}}$$

Table 1: Definitions of Operational Variables

Variable	Product Dimensions	No	Attribute Statement	Measurement Scale	Measurement Instruments
CustomerNeeds	Performance	1	Automated technology	Interval	Questionnaire
		2	Fast, real time and precise technology		
		3	Synchronized technology		
		4	Integrated technology		
	Features	5	Application program features are easy to understand and use	Interval	Questionnaire
		6	The time setting feature can be adjusted		
		7	Completeness of application program features		
		8	Connected technology components		
	Durability	9	Long service life of equipment	Interval	Questionnaire
	Product Prices	10	Affordable technology prices	Interval	Questionnaire
		11	Technology prices according to quality and benefits		
	Product Design	12	Technology is easy to operate	Interval	Questionnaire
		13	Technology easy to assemble		
		14	Technology is easy to remove		
	Product quality	15	Reliable technology	Interval	Questionnaire
		16	Real time and precise output		
	Customer satisfaction	17	Overall performance is good	Interval	Questionnaire
		18	Standard working time output		

Results and Discussion

A. Testing the Validity and Reliability of the Questionnaire

Validity and reliability testing was carried out on the questionnaire data that had been filled in by 12 respondents. The results of the validity and reliability testing are shown in Tables 2 and 3.

Table 2: Validity Test

No.	Attribute Statement	The value of r count (Satisfaction)	The value of r count (Expectation)	R table value	Ket
1	Automated technology	0.591	0.687	0.576	Valid
2	Fast, real time and precise technology	0.770	0.753	0.576	Valid
3	Synchronized technology	0.591	0.753	0.576	Valid
4	Integrated technology	0.621	0.822	0.576	Valid
5	Application program features are easy to understand and use	0.620	0.656	0.576	Valid

6	The time setting feature can be adjusted	0.731	0.747	0.576	Valid
7	Completeness of application program features	0.610	0.918	0.576	Valid
8	Connected technology components	0.587	0.646	0.576	Valid
9	The long service life of the equipment	0.646	0.626	0.576	Valid
10	Affordable technology prices	0.875	0.625	0.576	Valid
11	Technology prices according to quality and benefits	0.722	0.822	0.576	Valid
12	Technology is easy to operate	0.922	0.592	0.576	Valid
13	Technology easy to assemble	0.717	0.918	0.576	Valid
14	Technology is easy to remove	0.881	0.646	0.576	Valid
15	Reliable technology	0.729	0.625	0.576	Valid
16	Real-time and precise output	0.903	0.626	0.576	Valid
17	Overall performance is good	0.881	0.788	0.576	Valid
18	Standard working time output	0.881	0.753	0.576	Valid

If the correlation value for all the attributes of the statement produces a value of more than 0.576 with a significance level (α) of 5%, it can be concluded that all of these attributes are valid. The results show that for the measurement of the 18 items the overall data is valid or true with rcount>rtable (0.576).

Table 3: Reliability Test

	Cronbach's Alpha	N of Items
Satisfaction	0.825	18
Expectation	0.826	18

The results showed that the Cronbach alpha for the measurement of the 18 items was 0.825> 0.6. The closer the reliability coefficient to 1.0, the better the 18 attribute items. Thus, the consistency of reliability in this research measurement can be considered reliable or trustworthy [7].

B. Planning Matrix

1. Customer Satisfaction Performance

The user satisfaction level of the Pixy CMUcam5-based technology prototype is the level of user satisfaction with technology, regarding how well a technology product can meet user needs.

Table 4: User Satisfaction Level

No.	Attribute Statement	Total Variable	Mean (Satisfaction Level)
1	Automated technology	59	4.917
2	Fast, real time and precise technology	57	4.750
3	Synchronized technology	59	4.917
4	Integrated technology	57	4.750
5	Application program features are easy to understand and use	56	4.667
6	The time setting feature can be adjusted	55	4.583
7	Completeness of application program features	52	4.333
8	Connected technology components	54	4.500
9	Long service life of equipment	56	4.667
10	Affordable technology prices	56	4.667
11	Technology prices according to quality and benefits	56	4.667
12	Technology is easy to operate	54	4.500
13	Technology easy to assemble	54	4.500
14	Technology is easy to remove	55	4.583
15	Reliable technology	55	4.583
16	Real time and precise output	54	4.500
17	Overall performance is good	57	4.750

18	Standard working time output	57	4.750

2. Customer Expected Performance

The level of user expectations for the product is the level of expectation that the user wants to be applied to the development of technology products based on Pixy CMUcam5.

Table 5: User Expectation Levels

No.	Attribute Statement	Total Variable	Mean (level of expectation)	Weight of Interest
1	Automated technology	55	4.583	4
2	Fast, real time and precise technology	56	4.667	5
3	Synchronized technology	56	4.667	5
4	Integrated technology	57	4.750	5
5	Application program features are easy to understand and use	55	4.583	4
6	The time setting feature can be adjusted	55	4.583	4
7	Completeness of application program features	58	4.833	5
8	Connected technology components	59	4.917	5
9	The long service life of the equipment	55	4.583	4
10	Affordable technology prices	56	4.667	5
11	Technology prices according to quality and benefits	57	4.750	5
12	Technology is easy to operate	59	4.917	5
13	Technology easy to assemble	58	4.833	5
14	Technology is easy to remove	59	4.917	5
15	Reliable technology	56	4.667	5
16	Real-time and precise output	55	4.583	4
17	Overall performance is good	57	4.750	5
18	Standard working time output	56	4.667	5

3. User Satisfaction Index Analysis (IKP)

The User Satisfaction Index (IKP) states the level of user satisfaction with Pixy CMUcam 5 based technology.

Table 6: Level of User Satisfaction

No.	Attribute Statement	Mean (Satisfaction Level)	Mean (Expectation Level)	IKP
1	Automated technology	4.917	4.583	0,333
2	Fast, real time and precise technology	4.750	4.667	0,083
3	Synchronized technology	4.917	4.667	0,250
4	Integrated technology	4.750	4.750	0
5	Application program features are easy to understand and use	4.667	4.583	0,083
6	The time setting feature can be adjusted	4.583	4.583	0
7	Completeness of application program features	4.333	4.833	-0,500
8	Connected technology components	4.500	4.917	-0,417
9	Long service life of equipment	4.667	4.583	0,083
10	Affordable technology prices	4.667	4.667	0
11	Technology prices according to quality and benefits	4.667	4.750	-0,083
12	Technology is easy to operate	4.500	4.917	-0,417
13	Technology easy to assemble	4.500	4.833	-0,333
14	Technology is easy to remove	4.583	4.917	-0,333
15	Reliable technology	4.583	4.667	-0,083
16	Real time and precise output	4.500	4.583	-0,083
17	Overall performance is good	4.750	4.750	0
18	Standard working time output	4.750	4.667	0,083

Rata-Rata	4.644	4.718	-0.74

Based on the table above, it can be seen that the smallest IKP lies in the indicators (1) the completeness of the application program features (-0,500), (2) the technology is easy to operate (-0,417), (3) the technology components are connected easily (-0,417), (4) easy assembly technology (-0.333), (5) easy removal technology (-0.333). This shows that consumer expectations on both indicators are very high and have not been fully met. So that it needs to be improved and especially in the 5 indicators.

4. Determine Goals

Goal is a decision on user satisfaction goals that the researcher wants to achieve in assessing how much and to what extent to meet user expectations. The goal values are shown in Table 8.

5. Improvement Ratio

Improvement Ratio, the result of dividing the goal value by the value of the user's expectation level. The improvement ratio value is shown in Table 8.

Table 8: The Goal Value and Improvement Ratio

No.	Attribute Statement	Goal	Mean (Satisfaction Level)	Improvement Ratio
1	Automated technology	4	4.917	0.814
2	Fast, real-time and precise technology	4	4.750	0.842
3	Synchronized technology	4	4.917	0.814
4	Integrated technology	4	4.750	0.842
5	Application program features are easy to understand and use	4	4.667	0.857
6	The time setting feature can be adjusted	4	4.583	0.873
7	Completeness of application program features	**5**	4.333	1.154
8	Connected technology components	**5**	4.500	1.111
9	The long service life of the equipment	4	4.667	0.857
10	Affordable technology prices	4	4.667	0.857
11	Technology prices according to quality and benefits	4	4.667	0.857
12	Technology is easy to operate	**5**	4.500	1.111
13	Technology easy to assemble	**5**	4.500	1.111
14	Technology is easy to remove	4	4.583	0.873
15	Reliable technology	4	4.583	0.873
16	Real time and precise output	4	4.500	0.889
17	Overall performance is good	4	4.750	0.842
18	Standard working time output	4	4.750	0.842

Based on the ratio of improvements, indicators that must first are (1) the completeness of application program features (1,154), (2) technology is easy to operate (1,111), (3) connected technology components (1,111), (4) technology easy to assemble (1,111), (5) technology is easy to remove (0.873).

Conclusion

1. The indicators that have a negative IKP value are (1) the completeness of application program features (-0,500), (2) technology is easy to operate (-0,417), (3) connected technology components (-0,417), (4) technology easy to assemble (-0.333), (5) technology is easy to remove (-0.333). This shows that consumer expectations on the five indicators are very high and have not been fulfilled, so indicators are needed.
2. The ratio of improvements, indicators that must first are (1) the completeness of application program features (1,154), (2) technology is easy to operate (1,111), (3) connected technology components (1,111), (4) technology easy to assemble (1,111), (5) technology is easy to remove (0.873).

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